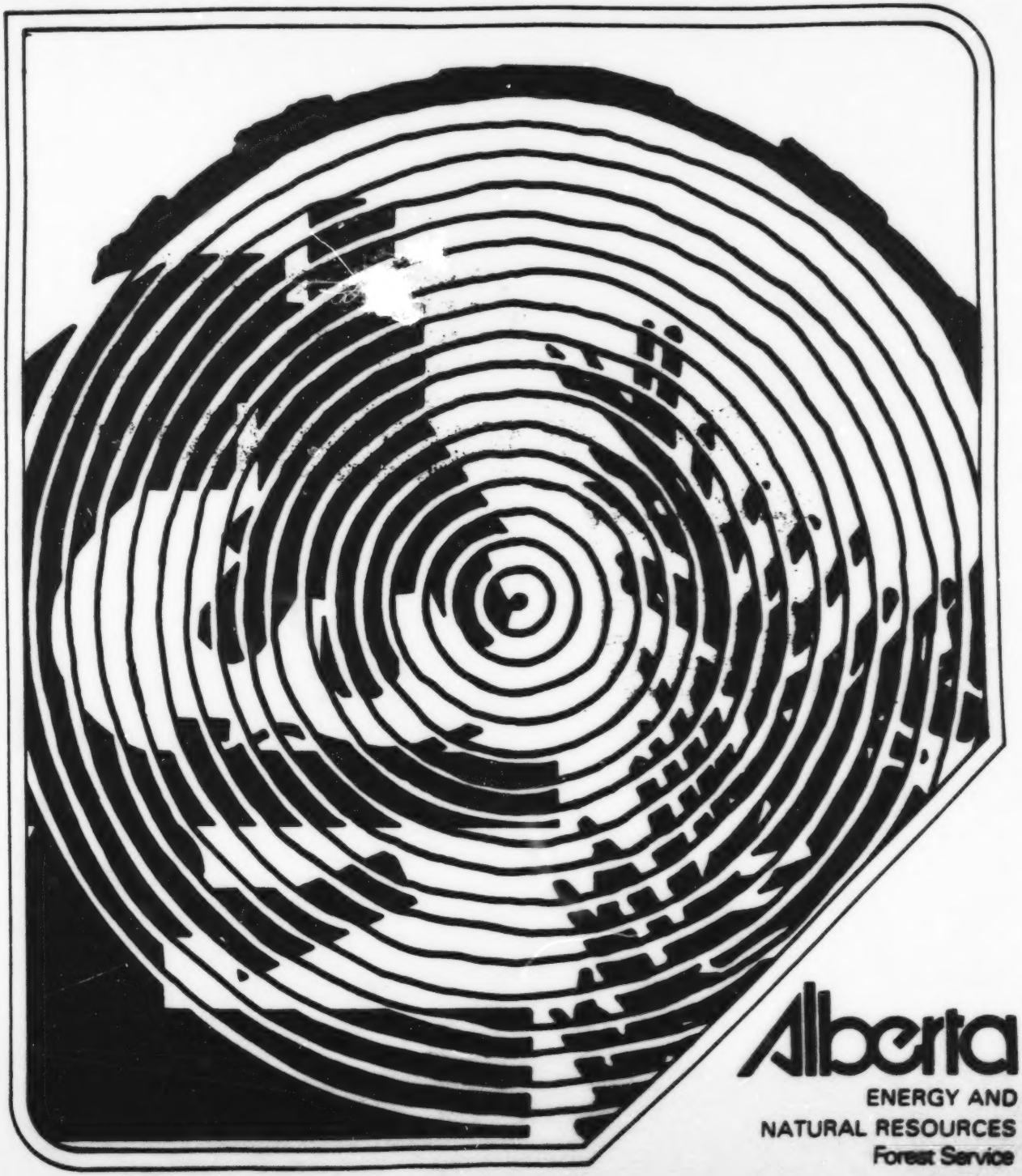
Forest Development Research Trust Fund

Annual Report 1983-84



Alberta

ENERGY AND
NATURAL RESOURCES
Forest Service

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FOREST DEVELOPMENT
RESEARCH TRUST FUND

ANNUAL REPORT
1983-84

1984
Edmonton

Alberta
ENERGY AND
NATURAL RESOURCES
Forest Service

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Alberta
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NATURAL RESOURCES
Forest Research Branch

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The Hon. John Zaozirny
Minister of Energy and Natural Resources
319 Legislative Building
Edmonton, Alberta
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Sir:

I have the honor to submit the Annual Report of the Forest Development Research Trust Fund for the fiscal year ending March 31, 1984.

Respectfully submitted,

J. Soos, Chairman
Advisory Council
Forest Development Research
Trust Fund

FOREWORD

Three new and six renewed studies were fincanced by the Forest Development Research Trust Fund during the 1983/84 fiscal year. Two studies were completed, one concerning the succession of vegetation around five lookout towers and the other relating to the determination of chemical and biological assay for blue-stain fungi.

The first new study on the application and testing of various pheromones for the detection and control of mountain pine beetles appeared to be very successful. University of Calgary scientists have developed six pheromone blends, of which two were very effective attracting up to four times as many beetles as other pheromones. This study is conducted in a close inter-agency co-operation between scientists of the university of Calgary, the Canadian Forestry Service and the Forest Protection Branch, Alberta Forest Service. The second new study attempts to develop a classification for drainage response of peatland in terms of tree growth. Two Finnish students are engaged in this study which provides thesis material for their MSc degree. The third new study investigates the feasibility of gibberelin hormone application as a tool for early evaluation and screening of superior families in tree improvement.

Progress was made by all investigators conducting research approved earlier on a wide variety of subject areas such as economic consequences of forest land losses to non-timber uses, pathological studies of Armillaria root rot, greenhouse studies related to the growth of various white spruce edaphic ecotypes, variation of anatomical and physical properties of aspen, identification of antifungal substances of western gall rust and determination of evapotranspiration of forested wetland sites.

The members of Forest Research Advisory Council deserve a great deal of credit for providing a critical review of research proposals and effectively participating in the affairs of Forest Development Research Trust Fund.

TABLE OF CONTENTS

		Page
1.	FOREST RESEARCH ADVISORY COUNCIL.....	1
2.	COMPLETED PROJECTS.....	3
3.	NEW PROJECTS.....	7
4.	RENEWED PROJECTS.....	13
5.	FINANCIAL STATEMENT.....	23

FOREST RESEARCH ADVISORY COUNCIL

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Forest Research Branch
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Chief Forester
St. Regis (Alberta) Ltd.
Hinton, Alberta

COMPLETED PROJECTS

DETERMINATION OF A CHEMICAL AND BIOLOGICAL ASSAY FOR BLUE-STAIN FUNGI

INVESTIGATORS: Dr. W.A. Ayer, University of Alberta
Dr. Y. Hiratsuka, University of Alberta

FLORA AND VEGETATION AROUND FIRE LOOKOUT TOWERS AND THEIR ACCESS ROADS IN WESTERN ALBERTA

INVESTIGATOR: Dr. G.H. LaRoi, University of Alberta

NEW PROJECTS

CHEMICAL COMMUNICATION (PHEROMONE) SYSTEM OF MOUNTAIN PINE BEETLE AND APPLICATION OF THE NATURAL PHEROMONE AND SYNTHETIC ANALOGS IN BEETLE MANAGEMENT

INVESTIGATORS: Dr. H. Wieser, University of Calgary
Dr. E.A. Dixon, University of Calgary

DURATION: Three years

OBJECTIVES: To evaluate the response of beetles to various structurally-related synthetic analogs of beetle-produced compound; to determine if any analogs tested provide a more potent attractant; to determine whether sex ratio shifts in favor of male or females; and to find relationship between molecular structure and attractive response for beetles in the field.

PROGRESS: Six different pheromone blends based on host tree produced monoterpine (M), terpine alcohol (tV) produced by female beetles and exobrevicomin (eB) produced by the male beetles were prepared and field tested on several areas in the Bow-Crow Forest. Results showed that two pheromone formulations were effective by attracting up to four times as many beetles as other pheromones. It was clearly demonstrated that beetles can be lured into certain areas and destroyed by using either baited traps or baited trees. Certain pheromone blends attracted a high percentage of female beetles which may become a useful tool for reducing beetle populations.

FUTURE WORK: Research on the improvement of the effectiveness and efficiency of trapping and luring beetles and to enhance understanding the process of chemoreception in mountain pine beetles will be conducted.

DRAINAGE GROWTH CLASSIFICATION SYSTEM OF ORGANIC SOILS IN ALBERTA

INVESTIGATORS: Dr. A.K. Hellum, University of Alberta
Dr. R.L. Rothwell, University of Alberta

DURATION: Two years

OBJECTIVES: To develop a classification system for assessing the potential for draining wetlands based on their vegetative characteristics.

PROGRESS: The study area in the Slave Lake Forest was selected and subsequently stratified into stand types by using aerial photographs. A total of 131 sample plots was established and descriptions of vegetation cover, tree growth and peat characteristics recorded. Both water and peat samples were collected and analysed for certain parameters such as pH, total dissolved solids, major cations and anions, cation exchange capacity and major nutrients (N,P,K). Tree mensuration data were also processed.

FUTURE WORK: Saturated hydraulic conductivity of peat will be measured on the previously-selected sample plots. Data will be analysed and theses prepared.

EARLY SCREENING FOR INHERENTLY SUPERIOR GROWTH IN CONIFERS: PRELIMINARY INVESTIGATION

INVESTIGATOR: Dr. R.P. Pharis

DURATION: One year

OBJECTIVES: To analyse Pinus radiata tissues of 14 families collected in Australia for edogenous hormone content and rate of radioactive gibberellin acid (GA_4) metabolism into biologically active and biologically inactive metabolites, and provide recommendations whether hormone analysis may provide a confirmatory tool for early screening of superior families.

PROGRESS: Progenies of 14 families of Pinus radiata were grown in a phytotron where some of the seedlings of same progenies were treated with gibberellin hormone (GA4/7). When seedlings were harvested and measured for height growth and stem dry weight after 200 days in the phytotron it was found that gibberellin-treated seedlings had perfect correlation with progenies grown outside for a period of 9+ years. On the other hand, those seedlings which were not treated with gibberellin hormones in the phytotron were showing diminishing correlation by the age of 200 days. Therefore the use of gibberellins may provide a "safety device" that will allow the researcher to determine whether growing conditions during early screening were indeed optimal.

FUTURE WORK: A report will be completed.

RENEWED PROJECTS

ECONOMIC CONSEQUENCES OF FOREST LAND LOSSES TO NON-TIMBER USES IN ALBERTA WITH PARTICULAR REFERENCE TO AGRICULTURE

INVESTIGATOR:	Dr. W.E. Phillips, University of Alberta
DURATION:	Three years
OBJECTIVES:	To identify and describe recent forest land-use changes from timber and related uses to other land uses with particular emphasis on agriculture. Economic analytical techniques and procedures used in assessing land-use changes will be examined in an economic framework including consequences.
PROGRESS:	The methodology of the project was refined with particular emphasis given to a critical review and evaluation of economic productivity measures applicable to forestry and agricultural land resource uses. Background tasks involving historical description of public land uses in Alberta, recent trends in the use of Alberta public lands for timber production and identification of pest and potential land-use conflicts have been completed. A cross-section analysis of the sawmilling industry was carried out.
FUTURE WORK:	Analysis of forest land use trade-offs with agriculture, coal and recreation will be conducted and a final report prepared.

VARIATION OF ANATOMICAL AND PHYSICAL PROPERTIES OF ASPEN IN ALBERTA

INVESTIGATOR: Dr. M.M. Micko, University of Alberta

DURATION: Five years

OBJECTIVES: To establish basic information about the variation of wood specific gravity and fibre length, growth rate and decay in naturally occurring aspen clones in Alberta.

PROGRESS: Samples of tree discs and large increment cores were collected from aspen stands in the Slave Lake area for fibre lengths and specific gravity determinations. Development of a method that uses a flourescent microscopy-video monitor system to display sample images was successful. A faster method of preparing macerated fibre samples was developed. Strength and other physico-mechanical properties of aspen wood with varying degree of heart-rot decay were also tested. Stained samples have lower, but generally acceptable strength, as compared with clear wood samples. Several research papers were submitted for journal publications and conference presentations.

FUTURE WORK: Additional samples of aspen will be collected from the Edson area and specific gravity and fibre length determinations will be carried out.

ISOLATION AND CHARACTERIZATION OF ANTIFUNGAL SUBSTANCE(S) PRODUCED BY *SCYTALIDIUM UREDINICOLA*, A HYPERPARASITE OF *ENDOCRONARTIUM HARKNESSII*, WESTERN GALL RUST

INVESTIGATOR: Dr. M.A. Pickard, University of Alberta

DURATION: Four years

OBJECTIVES: To determine the ability of compound(s) produced by *S. uredinicola* to inhibit the germination of *E. harknessii* spores *in vitro*, and to isolate and purify the active compounds. The effectiveness of the compounds will be tested *in vivo* against western gall rust on lodgepole and jack pine as a means of biological control.

PROGRESS: Investigations were conducted to determine the optimum conditions for storage and germination of *E. harknessii* spores, the growth characteristics of *Scytalidium* cultures on different media, the inhibition of spore germination by culture filtrates, the effect of high molecular weight fraction of culture filtrates on *E. harknessii* spores, and the effect on chloroform extracts of culture filtrates on spore germination. These results also have been published in the *Canadian Journal of Botany*.

FUTURE WORK: Development of a better method of concentrating viscous growth medium is necessary including preparation of a quantitative assay for the lytic compound. Non-germinating spores will be analysed to indicate the nature of the chemical structure or substrates involved.

PATHOLOGICAL AND PHYTOCHEMICAL STUDIES OF ARMILLARIA ROOT ROT OF INTENSIVELY MANAGED YOUNG CONIFEROUS FORESTS IN ALBERTA

INVESTIGATORS: Dr. Y. Hiratsuka, University of Alberta
Dr. W.A. Ayer, University of Alberta

DURATION: Three years

OBJECTIVES: To determine whether the weakening of the tree is necessary for disease expressions; to identify the posibility of a relationship between pathogen and disease distribution in several selective sites; to study the pathogenesis of the disease; and to identify biologically active metabolites produced by the pathogen.

PROGRESS: A comprehensive bibliography pertaining to Armillaria root rot has been completed. Cultures of Armillaria mellea representing various biological races were obtained from Japan, Australia and Kenya. Two definite biological races of Armillaria were identified in Alberta. One type was found in association with hardwoods in the spruce aspen subzone and the other was associated with pines on drier sites. Relative abilities of Alberta Armillaria isolates to kill pine seedlings were evaluated. Analysis of data revealed that the "trap log" technique is a useful method of studying the distribution of the pathogen in the field. Considerable work has been carried out on the chemical aspect of Armillaria. Several metabolites produced by Armillaria sp. were isolated and identified.

FUTURE WORK: The identification techniques for the Armillaria complex will be refined. Experiments will be conducted for the comparison of pathogenecity of Armillaria races found in Alberta to pine.

Chemical analysis for the identification of Armillaria produced metabolites will continue and their phytotoxic properties tested.

CORRELATION OF GLOBAL AND NET RADIATION WITH EVAPOTRANSPIRATION ON A FORESTED WETLAND SITE NORTHERN ALBERTA

INVESTIGATOR: Dr. R.L. Rothwell, University of Alberta

DURATION: Three years

OBJECTIVES: To establish a set of empirical relationships between total global shortwave radiation and water table fluctuations and net radiation and evapotranspiration for a forested wetland site. To use these relationships and attendant data as a basis for evaluation of existing methods for estimating evaporation from wetlands and/or develop a local method based on readily-available climatic data.

PROGRESS: Development of the study site was continued with the installation of various instruments on the tower at three different heights, canopy, screen and ground level. Data were collected consisting of hourly sums of net radiation and solar radiation, hourly averages of wind speed, relative humidity, ambient air temperature, vapor pressure, vapor pressure deficit and ground temperature. A shallow groundwater well was installed adjacent to the tower and was instrumented with Leopold-Stevens F-1 water level recorder. In addition, a set of heat flux plates were installed at depths of 5 cm and 10 cm below the surface to obtain estimates of ground heat fluxes and storage. All data collected were processed and stored in computer files and are ready for computer analysis.

FUTURE WORK: Data analyses and comparison of daily water table fluctuations to daily solar radiation and daily net radiation will be completed as will development of empirical

relationships between radiation inputs and daily water table fluctuations. Sampling program for climatic and groundwater parameters will be continued to increase the size and quality of data base.

FIELD AND GREENHOUSE PERFORMANCE

OF WHITE SPRUCE EDAPHIC ECOTYPES

INVESTIGATORS: Dr. D.J. Pluth, University of Alberta
Dr. B.P. Dancik, University of Alberta

DURATION: Four years

OBJECTIVES: To determine greenhouse survival and growth of white spruce seedling populations collected from areas having different calcium concentrations.

PROGRESS: White spruce seedlings were grown for a period of 6½ months in the greenhouse with periodic measurements and observations made during the experiment to assess progeny performance. Seedlings were then harvested and an evaluation of physical seedling characteristics such as basal stem diameter, height, number of branches, oven-dry shoot and root weight, weight of 100 needles and presence of mycorrhiza was made. Oven-dried needles and growing media were retained for future chemical analysis.

FUTURE WORK: Completion of this study requires carrying out soil, needle and growing medium analyses, observing progeny performance in hydroponic sand cultures with controlled solution composition and preparing of final report in the form of a MSc. thesis.

FOREST DEVELOPMENT RESEARCH TRUST FUND

FINANCIAL STATEMENTS

MARCH 31, 1984

Auditor's Report

Balance Sheet

Statement of Revenue, Expenditure and Unexpended Funds

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Council of the Forest Development
Research Trust Fund

I have examined the balance sheet of the Forest Development Research Trust Fund as at March 31, 1984 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1984 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

C.A.
Auditor General

Edmonton, Alberta
June 18, 1984

Statement A

FOREST DEVELOPMENT RESEARCH TRUST FUND

BALANCE SHEET

AS AT MARCH 31, 1984

	1984	1983
ASSETS		
Current:		
Deposits in trust (Note 3)	$220,498	$284,519
LIABILITIES		
Current:		
Research grants payable	$ 76,336	$ 72,147
Accounts payable	575	-
Unexpended funds, Statement B	143,587	212,372
	$220,498	$284,519

The accompanying notes are part of these financial statements.

Statement B

FOREST DEVELOPMENT RESEARCH TRUST FUND

STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS

FOR THE YEAR ENDED MARCH 31, 1984

	1984	1983
REVENUE		
Contributions by the Province of Alberta (Note 4)	$100,000	$100,000
Interest	22,368	41,137
Donations	115	115
	122,483	141,252
EXPENDITURE		
Research grants	190,693	152,825
Council members' fees and expenses	575	575
	191,268	153,400
Excess of expenditure over revenue	68,785	12,148
Unexpended funds at beginning of year	212,372	224,520
Unexpended funds at end of year	$143,587	$212,372

FOREST DEVELOPMENT RESEARCH TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 1984

Note 1 Authority

The Forest Development Research Trust Fund operates under the authority of the Forest Development Research Trust Fund Act, Chapter F-13, Revised Statutes of Alberta 1980.

Note 2 Significant Accounting Policies and Reporting Practices

Administration Expenses

Salaries, accommodation, and other overhead costs incurred in the administration of the Fund have been paid by the Province of Alberta and are not reflected in these financial statements.

Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Deposits in Trust

Deposits in trust consist of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 4 Due to the Province of Alberta

The Department of Energy and Natural Resources provides contributions annually for research and council members' expenditure incurred by the Fund. Where expenditure is less than the contributions in any given year, the balance is repayable to the General Revenue Fund of the Province.

	1984	1983
Contributions by the Province of Alberta	$100,000	$100,000
Expenditure	191,268	153,400
Due to the Province of Alberta	$ -	$ -

Note 5 Commitments

As at March 31, 1984, the Fund had research grant commitments totalling $140,435 (1983 $181,830).

Note 6 Approval of Financial Statements

These financial statements were approved by management on June 18, 1984.